

# UNCLASSIFIED

AD NUMBER
AD432806
NEW LIMITATION CHANGE
TO Approved for public release, distribution unlimited
FROM Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational use; 11 Nov 1963. Other requests shall be referred to Army Medical Research Lab, Fort Knox, KY.
AUTHORITY
USARO memo 15 Feb 1968

THIS PAGE IS UNCLASSIFIED

20030509158

Best Available Copy

**UNCLASSIFIED**  
**AD 432806**

**DEFENSE DOCUMENTATION CENTER**

**FOR**

**SCIENTIFIC AND TECHNICAL INFORMATION**

**CAMERON STATION, ALEXANDRIA, VIRGINIA**

Best Available Copy



**UNCLASSIFIED**

**NOTICE:** When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

432806 432806

US ARMY MEDICAL RESEARCH LABORATORY

PORT KNOX, KENTUCKY

REPORT NO. 594

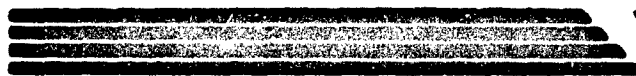
ACTIVE IMMUNIZATION OF A HUMAN AGAINST  
NAJA NAJA VENOM

A Preliminary Report

Capt Herschel H. Flowers, VC

CATALOGED BY DDC  
AS AD No.

MAY 27 1964



UNITED STATES ARMY

MEDICAL RESEARCH AND DEVELOPMENT COMMAND 12 November 1953

NO OTS

**Report Submitted 5 September 1963**

**Author**

**Capt Herschel H. Flowers, VC  
(JVM)**

**Pathology Division**

**The animals used in this study were handled in accordance with the "Principles of Laboratory Animal Care" established by the National Society for Medical Research.**

**Qualified requesters may obtain copies of this report from DDC.**

**Foreign announcement and dissemination of this report by DDC is limited.**

**REPORT NO. 594**

**ACTIVE IMMUNIZATION OF A HUMAN AGAINST  
NAJA NAJA VENOM**

**A Preliminary Report**

**Capt Herschel H. Flowers, VC**

**Pathology Division  
US ARMY MEDICAL RESEARCH LABORATORY  
Fort Knox, Kentucky**

**11 November 1963**

**In-House Laboratory Initiated Research and Development  
DA Project No. 3A013001A814**

USAMRL Report No. 594  
DA Project No. 3A013001A814

ABSTRACT

ACTIVE IMMUNIZATION OF A HUMAN AGAINST  
NAJA NAJA VENOM

A Preliminary Report

OBJECT

To determine whether or not a human subject could be immunized against the bite of the Indian cobra (Naja naja). To study the development and titer of neutralizing antibodies produced. To determine any pathological conditions produced by the injections during the course of immunization.

RESULTS

Tests demonstrated the theoretical neutralization potential of the subject's circulating globulin to be approximately 100 mg Naja naja venom. Examination of the subject during and after the course of the immunization schedule revealed development of no pathological conditions.

CONCLUSIONS

Using venoms with little or no local toxicity, it appears that man may be safely immunized.

APPROVED:

Fred D. Maurer  
FRED D. MAURER  
Colonel, VC  
Director, Pathology Division

APPROVED:

Sven A. Bach  
SVEN A. BACH  
Colonel, MC  
Director

## ACTIVE IMMUNIZATION OF A HUMAN AGAINST NAJA NAJA VENOM

### A Preliminary Report

Because of the complexity of venom proteins and their great local and systemic effects, active immunization has been confined to animals utilized in the production of commercial antivenins. In this study the feasibility of a safe and practical method of immunization of man against snakebite has been explored.

Parrish and Pollard (1) found that immunity against the effect of snakebite did not exist among 14 human subjects, each of whom had been bitten two or more times by Crotalid snakes. However, the development of a persistent immunity might not be anticipated in this group because envenomation occurred from 2-year to 14-year intervals, and the members of the group were also treated with antivenins following snakebite. The first observation of active immunization against snakebite was reported by Haast and Winer (2). A subject (human) was given repeated injections of crude cobra venom over a period of 2-1/2 years. A maximal injection of 40 mg of venom was tolerated, and this quantity of venom is lethal in the absence of immunity. Immunological tests were not performed with the serum or globulin to determine the degree of protection afforded by these injections, but the 40 mg immunizing dose of venom he tolerated is significant.

Wiener (3) described in one human subject the titer rise and persistence effected by repeated injections of Australian Tiger Snake venom. This subject survived the bite of a snake of this species with little difficulty subsequent to his immunization.

In this laboratory, in an attempt to measure the development of neutralizing antibodies, a human subject was given 17 injections containing increasing amounts of Indian cobra (Naja naja) venom. Venom solutions were passed through a millipore filter and then added to an equal volume of a 4% Sodium Alginate adjuvant.\* The 17 injections were given over a period of 5 months (Fig. 1). Ten ml of blood was withdrawn from the subject after the 4th, 7th, and 10th injections. Five hundred ml of blood was withdrawn after the 11th injection, and

\*Sodium Alginate Adjuvant, Colab Laboratories, Box 66, Chicago Heights, Illinois.



1 liter after the 17th. Globulins were separated from serum by ammonium sulfate precipitation, and the antivenin titer was determined by neutralization of Naja naja venom in 18-20 Gm Swiss mice. Identical neutralization tests were conducted by a commercial laboratory (Fig. 2).

The results of this study show a development of active immunization against cobra venom. One ml of the globulin solution neutralized 31 mouse LD<sub>50</sub>s (.244 mg venom). Since it required 100 ml of whole blood to produce 1 Gm of the crude globulin, it is estimated on a blood volume basis that 40 Gm are present in the subject's circulation. This circulating globulin alone therefore should neutralize a dose of 100 mg cobra venom. This calculation does not take into account the extravascular globulins present in the area of envenomation, which themselves are capable of venom neutralization.

The subject receiving cobra venom was under observation by a physician. Periodic blood and blood chemistry examinations were conducted to determine possible pathological conditions arising from the injections. Examination of the subject during and after the injections indicated the absence of pathological response to the venom except for local swelling and pain which persisted from 1 to 3 days in the area of injection. For a 2-week period after the 15th injection of venom, the subject's blood pressure was elevated slightly.

The potential advantages of active immunization of man against envenomation have been recognized for many years. The presence of locally necrotizing enzymes in some venoms still presents a formidable obstacle. However, in venoms with little or no local toxicity it appears that man may be safely immunized.

#### ACKNOWLEDGEMENT

The author gratefully acknowledges Wyeth Laboratories, Marietta, Pennsylvania, for their assistance in neutralization tests described in this report.

#### REFERENCES

1. Parrish, Henry M. and C. B. Pollard. Effects of repeated poisonous snakebites in man. Amer. J. Med. Sci., March 1959, pp. 277-286.

2. Haast, William E. and Melvin L. Winer. Complete and spontaneous recovery from a bite of a blue krait snake (Bungarus coeruleus). Amer. J. Trop. Med. and Hyg. 4: 1135, 1955.
3. Wiener, Saul. Active immunization of man against the venom of the Australian Tiger Snake (Notechis scutatus). Med. J. Australia, 1: 658, 1961.

DAYS	0	6	10	14	20	27	33	40	47
DOSE	.550 mg	.100 mg	.150 mg	.500 mg	.250 mg	.350 mg	.500 mg	.750 mg	1 mg
DAYS	54	61	72	86	100	30 DAY REST	130	130	145
DOSE	2 mg	4 mg	6 mg	8 mg	10 mg		6 mg	8 mg	10 mg

## IMMUNIZATION SCHEDULE

Fig. 1. Immunization schedule of human subject.

DEVELOPMENT LAB

# DEVELOPMENT REQUEST

By: Brown  
Mr. Frankhamer  
By: Lammert



Reference No. P-393  
Total Lot No. 637167  
Project No. A-111  
Date April 2, 1963

To: By: Criley From: John H. Henshaw  
Subject: Cobra Venom (Naja Naja - Capt. Flowers) vs.  
Ruman Jistulka (Capt. Flowers - dried.)  
Issue: Request of 2/24/63 Estimated  
Completion Date

vis. globulin restored to fluidity 1 cc. plus 0.05cc. diluent for  
injection 8/24/67.

## Results:

LD<sub>50</sub> 168/mg  
(1 LD<sub>50</sub> = 0.00595 mg.)

## Neutralization: Globulin v.s. venom

1 cc. of serum globulin solution as prepared  
above neutralized 10 L.D. of cobra venom.  
(0.021 cc. serum/c.c.v.)  
Test = 12-3-67.

Signature:

John Henshaw

JH/eye.

Fig. 2. Results of neutralization tests of subject's globulin against  
Naja naja venom.

# ARMED FORCES

## DISTRIBUTION

Armed Forces Institute of Pathology, Washington, D. C.  
 Army Attache, Fleet Post Office Box 79, Navy 100, New York, N. Y.  
 Chief, Life Sciences Division, Office of the Commanding General, Washington, D. C.  
 Chief, Medical Gen Lab, 406, Japan, US Army Med Comd, APO 343, San Francisco, Calif.  
 Chief, Preventive Med Div, Directorate of Professional Svc, SGO, Washington, D. C.  
 Chief, Research and Development Command, Scientific Information Br, Washington, D. C.  
 Comdt, Brooke Army Medical Center, Med Field Svc School, Ft. Sam Houston, Tex.  
 CG, I Corps Group, APO 358, San Francisco, Calif.  
 CG, Second US Army, Ft. George G. Meade, Md.  
 CG, 7th Logistical Command, APO 612, San Francisco, Calif.  
 CG, Eighth US Army, Attn: Surgeon, APO 381, San Francisco, Calif.  
 CG, US Army Alaska, APO 949, Seattle, Wash.  
 CG, US Army Europe, APO 483, New York, N. Y.  
 CG, US Army Hawaii, APO 937, San Francisco, Calif.  
 CG, US Army Materiel Command, Attn: AMC-RD, Washington, D. C.  
 CG, US Army Materiel Command, Research Division, Chemistry & Materials Br, Washington, D.C.  
 CG, US Army Materiel Research Lab, Biomechanical Lab, SGC, Washington, D. C.  
 CG, US Army Medical Research and Development Command, Washington, D. C.  
 CG, US Army Munitions Command, CBR, Edgewood, Md.  
 CG, US Army Natick Laboratories, (M2-7855) Natick, Mass.  
 CG, US Army Ordnance, Tank Auto Command, Detroit, Mich.  
 CG, US Army Pacific Medical Office, APO 598, San Francisco, Calif.  
 CG, US Army Quartermaster R&E Command, Technical Library Natick, Mass.  
 CG, US Army Ryukyu Islands, IX Corps, APO 331, San Francisco, Calif.  
 CG, US Army Transportation R&E Command, Ft. Eustis, Va.  
 CG, US Continental Army Command, Medical Section, Ft. Monro, Va.  
 CO, Brooke Army Medical Center, Surgical Research Unit, Ft. Sam Houston, Tex.  
 C Chemical Corps, Biological Documents Laboratory, Ft. Detrick, Md.  
 CO, Medical Technical Library, Fitzsimons General Hospital, Denver, Colo.  
 CO, Picatinny Arsenal, Dover, N. J.  
 CO, Quartermaster R&E FEA, US Army, Attn: Technical Publications Br, Ft. Lee, Va.  
 CO, US Army Aeromedical Research Unit, US Army Aviation Center, Ft. Rucker, Ala.  
 CO, US Army Combat Development Command, Combined Area Group, Ft. Leavenworth, Kan.  
 CO, US Army Combat Development Command, Materiel Svc, Ft. Sam Houston, Tex.  
 CO, US Army Combat, Development Command, Quartermaster Corps, Ft. Lee, Va.  
 CO, US Army Combat Development Command, Engineering Command, Ft. Belvoir, Va.  
 CO, US Army Command & General Staff College Library, Ft. Leavenworth, Kan.

# ARMED FORCES Cont.

## DISTRIBUTION

CO, US Army Electronic Proving Ground, Ft. Huachuca, Ariz.  
 CO, US Army Electronics R&D Laboratories, Attn: SELRA-GDA, Ft. Monmouth, N. J.  
 CO, US Army Engineer R&D Command, F. J. Belvoir, Va.  
 CO, US Army Environmental Hygiene Agency, Edgewood Arsenal, Md.  
 CO, US Army Liaison Group, Project Michigan, Univ of Mich, Ann Arbor, Mich.  
 CO, US Army Medical Liaison Br., Attn: Surgeon, Gorges Hosp, Balboa Htn, Canal Zone.  
 CO, US Army Medical Res & Nutrition Lab, Fitzsimons General Hosp, Denver, Colo.  
 CO, US Army Medical Research Unit, Ft. Clayton, Canal Zone.  
 CO, US Army Medical Research Unit, Inst for Medical Research Kuala Lumpur, Malaya.  
 CO, US Army Medical Research Unit, Ft. Detrick, Md.  
 CO, US Army Medical Research Unit, No. 1, APO 100, New York, N. Y.  
 CO, US Army Missile Support Comd, Attn: SMDS-MO, Redstone Arsenal, Ala.  
 CO, US Army Ordnance Arsenal, Frankford, Philadelphia, Pa.  
 CO, US Army Personnel Research Office, Washington, D. C.  
 CO, US Army Research Inst of Environmental Medicine, Netick Labs, Netick, Mass.  
 CO, US Army Tropical Research, APO 851, New York, N. Y.  
 CO, US Aviation Human Research Unit, Ft. Rucker, Ala.  
 Director of Research, US Army Air Defense Human Res Library, Ft. Bliss, Texas.  
 Director of Research, US Army Infantry Human Res Unit, Library, Ft. Benning, Ga.  
 Director of Research, US Army Leadership Human Res Unit Library, Presidio of Monterey, Calif.  
 Director, US Army-SEATO, Med Research Laboratory, APO 148, San Francisco, Calif.  
 Director, Walter Reed Army Inst of Res, Walter Reed Army Med Center, Washington, D. C.  
 Historical Unit, US Army Med Bn, Walter Reed Army Med Center, Washington, D. C.  
 Office of the Chief Psych & Neuro Consultant, SCD, Washington, D. C.  
 Office of the Dir, Division of Neurophy, Walter Reed Army Inst of Res, Washington, D. C.  
 Post Surgeon, US Army Dispensary, Springfield Armory, Springfield, Mass.  
 Senior Medical Advisor, Hqs KMAG, APO 102, San Francisco, Calif.  
 Walter Reed Army Inst of Res, Dept of Atomic Casualty Studies, Washington, D. C.

## HOSPITALS

CG, Brooke General Hospital Medical Library, Ft. Sam Houston, Tex.  
 CG, Letterman General Hospital, Presidio of San Francisco, Calif.  
 CG, Madigan General Hospital, Tacoma, Washington.  
 CG, William Beaumont General Hospital Library, El Paso, Tex.  
 CG, Bassett Army Hospital, Ft. Jonathan Wainwright, Fairbanks, Alaska.  
 CG, DeWitt Army Hospital, Ft. Belvoir, Va.  
 CG, Dunham Army Hospital, Carlisle Barracks, Pa.

ARMED FORCES - HOSPITALS Cont.

DISTRIBUTION

CO. Ireland Army Hospital, Ft. Knox, Ky.  
CO. Irwin Army Hospital, Ft. Riley, Kan.  
CO. Keener Army Hospital, Ft. Lee, Va.  
CO. Kimbrough Army Hospital, Ft. George G. Meade, Md.  
CO. Kirk Army Hospital, Aberdeen Proving Ground, Md.  
CO. McDonald Army Hospital, Ft. Eustis, Va.  
CO. Martin Army Hospital, Ft. Benning, Ga.  
CO. Munson Army Hospital, Ft. Leavenworth, Kan.  
CO. Noble Army Hospital, Ft. McClellan, Ala.  
CO. Patterson Army Hospital, Ft. Monmouth, N. J.  
CO. Wilson Army Hospital, Ft. Dix, N. J.  
CO. Walter Reed General Hospital, Washington, D. C.  
CO. Weaver Army Hospital, Ft. Bragg, N. C.  
CO. US Army Hospital, Ft. Benjamin Harrison, Indianapolis, Ind.  
CO. US Army Hospital, Ft. Campbell, Ky.  
CO. US Army Hospital, Ft. Carson, Colorado.  
CO. US Army Hospital, Ft. Dix, N. J.  
CO. US Army Hospital, Ft. Devens, Mass.  
CO. US Army Hospital, Ft. Gordon, Ga.  
CO. US Army Hospital, Ft. Hood, Tex.  
CO. US Army Hospital, Ft. Jackson, S.C.  
CO. US Army Hospital, Ft. Jay, N. Y.  
CO. US Army Hospital, Ft. Leonard Wood, Mo.  
CO. US Army Hospital, Ft. McPherson, Ga.  
CO. US Army Hospital, Ft. MacArthur, Calif.  
CO. US Army Hospital, Ft. Monroe, Va.  
CO. US Army Hospital, Ft. Ord, Calif.  
CO. US Army Hospital, Ft. Polk, La.  
CO. US Army Hospital, Ft. Rucker, Ala.  
CO. US Army Hospital, Ft. Sill, Okla.  
CO. US Army Hospital, Ft. Stewart, Ga.  
CO. US Army Hospital, Ft. Walters, Tex.  
CO. US Army Hospital, Camp Loring Johnson, New Orleans, La.  
CO. US Army Hospital, Duquoy Proving Ground, Utah.  
CO. US Army Hospital, Redstone Arsenal, Ala.

ARMED FORCES-HOSPITALS Cont.

DISTRIBUTION

CO, US Army Hospital, Sierra Army Depot, Norlong, Calif.  
CO, US Army Hospital, White Sands Missile Range, N. Mex.

NAVY

Aviation Medical Acceleration Lab, US Naval Air Development Cent, Johnsville, Pa.  
Aviation Psychol Laboratory, US Naval School of Aviation Medicine, Pensacola, Fla.  
Bureau of Naval Weapons, Washington, D. C.  
Chief, Bureau of Yards and Docks, Washington, D. C.  
Chief of Naval Air Research Training, Glenview, Ill.  
Chief of Naval Air Technical Training, US Naval Air Station (75), Memphis, Tenn.  
Commander, Naval Missile Center, Technical Library, Point Mugu, Calif.  
CO, Naval Air Materiel Center, Technical Library, Philadelphia, Pa.  
CO, US Naval Civil Engineer Lab, Port Hueneme, Calif.  
CO, US Naval Medical Field Research Lab, Library, Camp Lejeune, N. C.  
CO, US Naval Ordnance Test Sta, Station Hospital, China Lake, Calif.  
CO, US Naval Radiological Defense Lab, San Francisco, Calif.  
Director, Aerospace Crew Equipment Lab, Naval Air Engr Center, Philadelphia, Pa.  
Director Research Division (71) Bureau of Medicine & Surgery, Washington, D. C.  
Director, US Naval Research Laboratory, Code 2027, Washington, D. C.  
Director of Laboratories NHB, National Naval Medical Center, Bethesda, Md.  
Office of Naval Res Br, Document & Tech Infor, Box 39, Navy 100, Fleet PO, New York, N. Y.  
Office of Naval Research, Code 545, Washington, D. C.  
Officer in Charge, Engr Diving Unit, US Naval Sta, Navy Yard Annex, Washington, D. C.  
Officer in Charge, Operations Evaluations Group, Washington, D. C.  
Special Assistant, Medical Allied Sciences, Washington, D. C.  
Technical Reference Library, Naval Med Res Inst, Nat'l Naval Med Center, Bethesda, Md.  
US Naval Research Laboratory, US Naval Submarine Base, Groton, Conn.  
US Naval Supply Res & Development Facility, Clothing Textile Div, Brooklyn, N. Y.  
US Naval Training Device Center, Code 34, Port Washington, N. Y.  
US Navy Medical Neuropsychiatric Research Unit, San Diego, Calif.

US AIR FORCE

Air Defense Comd, Ent Air Force Base, Colo.  
Assistant for Ground Safety, US Air Force, Washington, D. C.  
Comdr, Rome Air Development Center, Griffiss AFB, N. Y.  
Comdr, 6570 AMRL (HNSA) Wright-Patterson AFB, Ohio  
Comdr, 6570 AMRL (HNSON) Wright-Patterson AFB, Ohio  
Comdr, 6570 AMRL (HNPFL) Wright-Patterson AFB, Ohio  
Comdr, Wilford Hall, US Air Force Hospital, Lackland AFB, Tex.



ARMED FORCES - US AIR CONT.

DISTRIBUTION

Electronic Systems Div. Division Sci Lab. L. G. Hanscom Field, Bedford, Mass.  
Hqs-AF Office of Scientific Res. (Temple Bldg D) Washington, D. C.  
Langley Research Center, Nat'l Aeronautics & Space Admin. Hampton, Va.  
Office of the Surgeon, Air Tng Command, Randolph AFB, Tex.  
Office of the Surgeon, Hqs Strategic Air Command, Offutt AFB, Neb.  
School of Aerospace Medicine, Aeromedical Library, Brooks AFB, Tex.  
Science Div. AFMSTA, Hqs US Air Force, The Pentagon, Washington, D. C.  
US Air Force Epidemiological Laboratory, US Air Force, Lackland AFB, Tex.  
6571st Aeromedical Research Laboratory Library, Nellis AFB, N. Mex.

GOVERNMENTAL AGENCIES

Argonne National Laboratory, Technical Information Div. Argonne, Ill.  
Armed Forces Radiobiology Res Inst. National Naval Medical Center, Bethesda, Md.  
Brookhaven National Lab. Associated Universities Inc. Library, Upton, L. I., N. Y.  
Chief, Defense Atomic Support Agency, Document Library Br. Washington, D. C.  
Chief, Radiation Br. National Cancer Institute, Bethesda, Md.  
Civil Aeromedical Research Inst. Federal Aviation Agency, Oklahoma City, Okla.  
Defense Documentation Center Hqs, Cameron Station, Alexandria, Va.  
Dept of Health Educ & Welfare, Div of Radiol Health-PHS, Washington, D. C.  
Division of Biology & Medicine, US Atomic Energy Commission, Washington, D. C.  
Division of Medical Sciences, National Research Council, Washington, D. C.  
Executive Secretary, Committee of Vision, Nat'l Res Council, Washington, D. C.  
Library of Congress, Science & Technology Division, Washington, D. C.  
National Aeronautics & Space Administration, Washington, D. C.  
National Institute of Health, Division of Research Grants, Bethesda, Md.  
National Library of Medicine, Bethesda, Md.  
Office of Civil Defense, Technical Research Laboratory, Battle Creek, Mich.  
US Atomic Energy Commission, Reports Analysis Tech Infor Sec. Oak Ridge, Tenn.

OTHER AGENCIES

Abbott Laboratories, Science Information Services, N. Chicago, Ill.  
American Machine Foundry Co. New York, N. Y.  
Arctic Health Research Center Library, Anchorage, Alaska.  
Central Medical Library, 11-42, The Boeing Co, Seattle, Wash.  
Chief, Biotechnology Section, Aerospace Division, The Boeing Co, Seattle, Wash.  
Document Control Desk, The Bioscience Co, Boston, Mass.  
General Electric Co, Advanced Electric Center Library, Ithaca, N. Y.  
General Electric Co, Temple Library, Santa Barbara, Calif.

#### OTHER AGENCIES

##### DISTRIBUTION

IDM Research Center, Engr Science Dept 475, Yorktown Heights, N. Y.  
ITT Federal Laboratories, Human Factors Group, Nutley, N. J.  
Kings County Hospital, Department of Anesthesiology Library, Brooklyn, N. Y.  
Mayo Clinic, Director of Biophysics Division, Rochester, Minn.  
McDonnell Aircraft Corp, St. Louis, Mo.  
Psychological Abstracts, Washington, D. C.  
Rend Corporation, Library, Santa Monica, California.  
Rhone Caliform Corporation, Los Angeles, Calif.  
Space Tech Laboratories, Subcommittee on Noise, Los Angeles, Calif.  
The Boeing Company Library, Military Aircraft Systems Div, Wichita, Kan.  
The John Crerar Library, Chicago, Ill.  
The Lovelace Foundation, Dept of Aerospace Med & Biomechanics, Albuquerque, N. Mex.  
The Research Analysis Corp Library, Bethesda, Md.  
Yerkes Laboratories of Primate Biology, Orange Park, Fla.

##### MEDICAL COLLEGE/SCHOOL LIBRARIES AND DEPTS

Albany Medical College Library, Albany, N. Y.  
Benson Gray School of Medicine, Library, Winston-Salem, N. C.  
Brown Univ, Psychology Dept, Consultant, Providence, R. I.  
College of Medical Evangelists, Vernal Redcliff Memorial Library, Long Linda, Calif.  
College of Physicians of Philadelphia, Library, Philadelphia, Pa.  
Columbia Univ, Dept of Psychology, New York, N. Y.  
Columbia Univ, Medical Library, New York, N. Y.  
Cornell Univ, Central Serial Record Department, Ithaca, N. Y.  
Cornell Univ, Medical Library, New York, N. Y.  
Creighton Univ, Medical Pharmacy Library, Omaha, Neb.  
Dartmouth College, Dana Neurological Library, Hanover N. H.  
George Washington Univ, Office of Human Resources Research, Alexandria, Va.  
Harvard Univ, Medical Library, Boston, Mass.  
Indiana Univ, Medical Center Library, Indianapolis, Ind.  
Indiana Univ, School of Medicine Library, Bloomington, Ind.  
Jefferson Medical College, Library, Philadelphia, Pa.  
Johns Hopkins Univ, Welch Medical Library, Baltimore, Md.  
Kansas State Univ, Department of Psychology, Manhattan, Kan.  
Long Linda Univ, White Memorial Medical Library, Los Angeles, Calif.

MEDICAL COLLEGE / SCHOOL LIBRARIES AND DEPTS Cont.

DISTRIBUTION

Marquette Univ. Medical-Dental Library, Milwaukee, Wis.  
Medical College of Virginia, Tompkins-McCaw Library, Richmond, Va.  
New York Academy of Medicine Library, New York, N. Y.  
New York Univ. College of Medicine, Research Division, New York, N. Y.  
New York Univ. College of Engg, Research Division, New York, N. Y.  
New York Univ. Medical Center Library, New York, N. Y.  
Northwestern Univ. Department of Psychology, Evanston, Ill.  
Northwestern Univ. Medical School Library, Chicago, Ill.  
Ohio State Univ. Chemical Abstracts Service, Columbus, Ohio  
Ohio State Univ. Engr Experiment Station, Systems Research Group, Columbus, Ohio.  
Ohio State Univ. Psycholinguistics Laboratory, Columbus, Ohio.  
Ohio State Univ. Research Center, Aviation Psychology Laboratory, Columbus, Ohio.  
Ohio State Univ. School of Optometry, Columbus, Ohio.  
Ohio State Univ. Topas Library, Columbus, Ohio  
Purdue Univ. Department of Psychology, Lafayette, Ind.  
Rush Medical College Library, Chicago, Ill.  
St. Louis Univ. Medical School Library, St. Louis, Mo.  
Stanford Univ. Lane Medical Library, Palo Alto, Calif.  
State Univ of Iowa, College of Medicine Library, Iowa City, Iowa.  
State Univ of Iowa, Univ Hosp, Dept of Otolaryng & Maxillofacial Surg, Iowa City, Iowa.  
State Univ of New York, Anesthesiology Department, Brooklyn, N. Y.  
State Univ of New York, Medical Library, Downtown Medical Center, Brooklyn, N. Y.  
Texas Medical Center Library, Jesse H. Jones Library Bldg, Houston, Tex.  
Tufts Univ. Human Engineering Information Analysis Service, Medford, Mass.  
Tulane Univ. School of Medicine, New Orleans, La.  
Vanderbilt Univ. Hospital Library, Birmingham, Ala.  
Univ of Alabama, Medical Center Library, Birmingham, Ala.  
Univ of Arkansas, Medical Center Library, Little Rock, Ark.  
Univ of Buffalo, Department of Psychology, Buffalo, N. Y.  
Univ of Buffalo, Health Sciences Library, Buffalo, N. Y.  
Univ of California, Biomedical Library, Los Angeles, Calif.  
Univ of Chicago, Radiation Laboratory, Chicago, Ill.  
Univ of Cincinnati, College of Medicine, Kettering Lab, Cincinnati, Ohio  
Univ of Florida, College of Medicine, Gainesville, Fla.  
Univ of Georgia, Department of Psychology, Athens, Ga.

# MEDICAL COLLEGE/SCHOOL LIBRARIES AND DEPTS Cont.

## DISTRIBUTION

Univ of Illinois, Aeromedical Laboratory, Chicago, Ill.  
 Univ of Illinois, Aviation Psychology Laboratory, Savoy, Ill.  
 Univ of Illinois, Documents Division Library, Urbana, Ill.  
 Univ of Illinois, Speech and Hearing Clinic, Champaign, Ill.  
 Univ of Illinois, Training Research Laboratory, Urbana, Ill.  
 Univ of Kansas, Glendon Medical Library, Kansas City, Kan.  
 Univ of Kansas, Psychology Department, Manhattan, Kan.  
 Univ of Kentucky, Psychology Department, Lexington, Ky.  
 Univ of Louisville, Medical Library, Louisville, Ky.  
 Univ of Maryland, Health Sciences Library, Baltimore, Md.  
 Univ of Miami, School of Medicine, Department of Ophthalmology, Miami, Fla.  
 Univ of Miami, School of Medicine, Department of Psychology, Coral Gables, Fla.  
 Univ of Michigan, General Library of Serials & Documents, Ann Arbor, Mich.  
 Univ of Minnesota, Serials Division Library, Minneapolis, Minn.  
 Univ of Mississippi, Medical Center, Holston Medical Library, Jackson, Miss.  
 Univ of Missouri, Medical Library, Columbia, Mo.  
 Univ of Nebraska, College of Medicine Library, Omaha, Neb.  
 Univ of North Carolina, Div of Health Affairs, Memorial Hosp Library, Chapel Hill, Va.  
 Univ of Oklahoma, Medical Center Library, Oklahoma City, Okla.  
 Univ of Oregon, Medical School Library, Portland, Ore.  
 Univ of Oregon, Department of Dermatology, Portland, Ore.  
 Univ of Pittsburgh, Department of Psychology and Radiology, Pittsburgh, Pa.  
 Univ of Pittsburgh, Folk Library, Pittsburgh, Pa.  
 Univ of Rochester, Atomic Energy Project, Rochester, N. Y.  
 Univ of Rochester, Department of Psychology, Rochester, N. Y.  
 Univ of Rochester, School of Medicine & Dentistry, Rochester, N. Y.  
 Univ of Rochester, Strong Memorial Hospital, Rochester, N. Y.  
 Univ of Southern California, School of Medicine Library, Los Angeles, Calif.  
 Univ of Southern California, Serials Library, Los Angeles, Calif.  
 Univ of South Dakota, Medical Library, Vermillion, S. D.  
 Univ of Tennessee, Hooton Memorial Library, Memphis, Tenn.  
 Univ of Texas, The Radiobiology Laboratory, Austin, Tex.  
 Univ of Texas, Medical Branch Library, Galveston, Tex.  
 Univ of Texas, Speech & Hearing Clinic, Austin, Tex.  
 Univ of Utah, Library of Medical Sciences, Salt Lake City, Utah.  
 Univ of Vermont, College of Medicine Library, Burlington, Vt.  
 Univ of Virginia, School of Medicine, Biostatistics, Charlottesville, Va.

**MEDICAL COLLEGE/SCHOOL LIBRARIES AND DEPTS Cont.**

**DISTRIBUTION**

Univ of Virginia, Medical Library, Univ Hospital, Charlottesville, Va.  
Univ of Virginia, Psychology Department, Charlottesville, Va.  
Univ of Washington, Health Sciences Library, Seattle, Wash.  
Univ of Wisconsin, Medical School Library, Madison, Wis.  
Univ of Wisconsin, Psychology Studies Division, Madison, Wis.  
Wayne State Univ, Medical Library, Detroit, Mich.  
West Virginia Univ, Medical Center Library, Morgantown, W. Va.  
Yale Univ, School of Medicine, Otolologic Research Laboratory, New Haven, Conn.  
Xavier Univ, Department of Psychology, Cincinnati, Ohio

**FOREIGN**

Associazione Dept, Nat'l Leading Library for Sci & Tech, Boston SPA, Yorkshire, England  
American Embassy, The Foreign Env of America, Attn: Asst Med Attache, London, England  
British Army Medical Liaison Officer, British Embassy, Washington, D. C.  
British Navy Staff Officer, Benjamin Franklin Sta, Attn: F. P. Ellis, Washington, D. C.  
Canadian Liaison Officer, Office of the Surgeon General, Washington, D. C.  
Chester Beatty Res Inst, Royal Cancer Hosp, Attn: Peter Alexander, London, England  
Commander P. N. Seneel, Med En Chef De La, Marine, Paris, France  
Defense Research Member, Canadian Joint Staff, Washington, D. C.  
Dr. Martti J. Kervanen, Dir Physiol Dept, The Inst of Group Health, Helsinki, Finland  
Dr. Jan Versell, Dept of Histology, Karolinska Inst, Stockholm, Sweden  
Dr. G. H. Sydenham, Dir Appl Physiol Lab, TWL & O.F.S. Chamber of Mines, Johannesburg, S. Africa  
Eichii Nagashima Extn Info Svc, The Nat'l Inst of Animal Health, Tokyo, Japan  
Escuela de Sauidad Militar, V. Cda Smilar, Attn: Espato C. C. Ribeiro, Asuncion, Paraguay  
German Military Attache, Federal Ministry of Defense, Washington, D. C.  
Inst of Clinical Exper Surgery, Attn: Dr. Liaba, Prague, Hra, Czechoslovakia  
Inst of Exper Med & Surg, Attn: Dr. Hans Selze, Dir Univ of Montreal, Montreal, Canada  
Inst of Physiology, Univ of Pisa, Attn: Giuseppe Morandi, Pisa, Italy  
Laboratory of General Pathology Therapy, Attn: Prof Zoran H. Buzg, Liege, Belgium  
Medical Sciences Library, University of Alberta, Edmonton, Alberta, Canada  
Oxford Univ, Department of Human Anatomy, Attn: Dr. A. R. Lind, Oxford, England  
Prof D. Bonatti, Dir Inst de Ciencias Fisiologicas, Montevideo, Uruguay  
Prof R. W. Ditchburn, J. J. Thompson Physiol Lab, Berke Univ, Berke, England  
Prof D. H. MacKay, Univ of N. Staffordshire, Keele, Staffordshire, England  
Prof J. A. F. Stevenson Faculty of Med, Univ of Western Ont, London, Ont, Canada  
Royal Air Force Inst of Aviation Med, Attn: Dr. G. H. Byford, Farnborough, England  
Royal Air Force Inst of Aviation Med, Attn: Lt. J. C. Guignard, Farnborough, England  
Royal Society of Medicine Library, London England  
Univ of Western Ontario Med School, Attn: Dr. Allan C. Barton, London, Ont, Canada

Accession No.

US Army Medical Research Lab. Ft. Knott, Ky.  
ACTIVE IMMUNIZATION OF A HUMAN AGAINST MALARIA  
VENOM - A PRELIMINARY REPORT - M. H. FLORES  
Report No. 594, 12 Nov 63, 5 pp 6 1 - 2 illus -  
DA Project No. 34813801A914, Unclassified Report

UNCLASSIFIED  
1. Venom  
2. Immunization

Seventeen injections of Indian cobra (Naja naja) venom were administered to a human subject for the production of an active immunity. The development of a significant level of antivenin was demonstrated by neutralization tests. The immunization procedure produced no significant pathological effects.

AD

Accession No.

US Army Medical Research Lab. Ft. Knott, Ky.  
ACTIVE IMMUNIZATION OF A HUMAN AGAINST MALARIA  
VENOM - A PRELIMINARY REPORT - M. H. FLORES  
Report No. 594, 12 Nov 63, 5 pp 6 1 - 2 illus -  
DA Project No. 34813801A914, Unclassified Report

UNCLASSIFIED  
1. Venom  
2. Immunization

Seventeen injections of Indian cobra (Naja naja) venom were administered to a human subject for the production of an active immunity. The development of a significant level of antivenin was demonstrated by neutralization tests. The immunization procedure produced no significant pathological effects.

Accession No.

US Army Medical Research Lab. Ft. Knott, Ky.  
ACTIVE IMMUNIZATION OF A HUMAN AGAINST MALARIA  
VENOM - A PRELIMINARY REPORT - M. H. FLORES  
Report No. 594, 12 Nov 63, 5 pp 6 1 - 2 illus -  
DA Project No. 34813801A914, Unclassified Report

UNCLASSIFIED  
1. Venom  
2. Immunization

Seventeen injections of Indian cobra (Naja naja) venom were administered to a human subject for the production of an active immunity. The development of a significant level of antivenin was demonstrated by neutralization tests. The immunization procedure produced no significant pathological effects.

AD

Accession No.

US Army Medical Research Lab. Ft. Knott, Ky.  
ACTIVE IMMUNIZATION OF A HUMAN AGAINST MALARIA  
VENOM - A PRELIMINARY REPORT - M. H. FLORES  
Report No. 594, 12 Nov 63, 5 pp 6 1 - 2 illus -  
DA Project No. 34813801A914, Unclassified Report

UNCLASSIFIED  
1. Venom  
2. Immunization

Seventeen injections of Indian cobra (Naja naja) venom were administered to a human subject for the production of an active immunity. The development of a significant level of antivenin was demonstrated by neutralization tests. The immunization procedure produced no significant pathological effects.